Reduced Electron Models for Kinetic Edge Simulation[+]

R.H. Cohen[*], M. Dorf, M. Dorr, W.M. Nevins, T.D. Rognlien

[1] *Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, CA 94550 USA*
** Email: rcohen@llnl.gov*

There is now a number of efforts world-wide to develop whole-edge multi-dimensional kinetic simulation codes. This was in response to the recognition that finite mean-free-path effects along magnetic field lines and finite-ion-radial-orbit widths make the validity of fluid treatments marginal. These new codes are based on drift or gyrokinetics. As with their cousins for core plasmas, the addition of fully kinetic electrons, while desirable, is computationally challenging because of short timescales and difficulties associated with avoiding numerical instabilities. So it is desirable to consider reduced models.

In this paper we survey a number of reduced options, including adiabatic electron models, massless and finite-mass fluid models, massless kinetic models, and implicit fully kinetic models. For each we discuss what significant physics is captured or lost, and also consider the numerical consequences (ease of implementation and run requirements) within the context of the continuum edge kinetic code COGENT[1].

[1] M. Dorf, R.H. Cohen, M. Dorr *et al.*, this meeting

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